KRAMER ELECTRONICS LTD.

USER MANUAL

MODEL:

VS-41HDCP
4x1 DVI Switcher

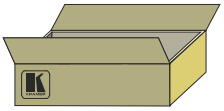
P/N: 2900-000522 Rev 2

VS-41HDCP Quick Start Guide

This page guides you through a basic installation and first-time use of your **VS-41HDCP**. For more detailed information, see the **VS-41HDCP** user manual. You can download the latest manual at http://www.kramerelectronics.com.

Step 1: Check what's in the box

- The **VS-41HDCP** 4x1 DVI Switcher
- 1 power adapter (5V DC)
- 4 rubber feet
- RC-IR3 IR remote control transmitter with batteries and user manual
- 1 Quick start sheet
- 1 User Manual



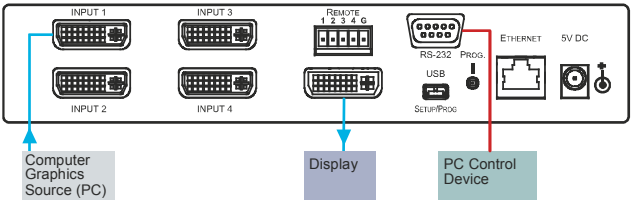
Save the original box and packaging materials in case your Kramer product needs to be returned to the factory for service.

Step 2: Install the VS-41HDCP

Mount the machine in a rack (using the RK-1 rack adapter) or place on a table.

Step 3: Connect the inputs and output

Always switch off the power on each device before connecting it to your **VS-41HDCP**.



For best results, we recommend that you always use Kramer high-performance cables to connect AV equipment to the **VS-41HDCP**.

Step 4: Connect the power

Connect the 5V DC power adapter to the **VS-41HDCP** and plug the adapter into the mains electricity.

Switch on the power to each device.

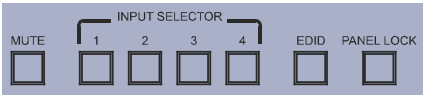
Step 5: Operate the VS-41HDCP

Acquire the EDID:

1. Connect the power supply.
2. Connect the new output display.
3. Press the EDID button.
4. Wait for the input buttons to stop blinking in sequence.

To acquire the default EDID, skip step 2 above.

Operate via the front panel buttons:



Operate the **VS-41HDCP** also via the RS-232, remote control contact closure and IR remote control.

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1 Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront the video, audio, presentation, and broadcasting professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better! Our 1,000-plus different models now appear in 11 groups that are clearly defined by function.

Our 1,000-plus different models now appear in 11 groups that are clearly defined by function: GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Matrix Switchers; GROUP 3: Control Systems; GROUP 4: Format/Standards Converters; GROUP 5: Range Extenders and Repeaters; GROUP 6: Specialty AV Products; GROUP 7: Scan Converters and Scalers; GROUP 8: Cables and Connectors; GROUP 9: Room Connectivity; GROUP 10: Accessories and Rack Adapters and GROUP 11: Sierra Products.

Congratulations on purchasing your Kramer **VS-41HDCP** *4x1 DVI Switcher*. The **VS-41HDCP** is ideal for conference room presentations and advertising applications, as well as for rental and staging.

2 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment
- Review the contents of this user manual
- Use Kramer high-performance high-resolution cables
- Use only the power cord that is supplied with this machine

Go to http://www.kramerelectronics.com to check for up-to-date user manuals, application programs (where appropriate), and to check if firmware upgrades are available.

2.1 Achieving the Best Performance

To achieve the best performance:

- Use only good quality connection cables to avoid interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables)
- Avoid interference from neighboring electrical appliances that may adversely influence signal quality
- Position your Kramer **VS-41HDCP** away from moisture, excessive sunlight and dust

Caution: No operator serviceable parts inside the unit

Warning: Use only the Kramer Electronics input power wall adapter that is provided with the unit

Warning: Disconnect the power and unplug the unit from the wall before installing

3 Overview

The **VS-41HDCP** is a high quality 4x1 switcher for DVI signals that supports up to 2.25Gbps bandwidth per graphic channel (suitable for resolutions up to UXGA at 60Hz, and for all HD resolutions). It equalizes the signal and switches one of the four inputs to a single DVI output.

In particular, the **VS-41HDCP**:

- Is HDCP (High Definition Digital Content Protection) compliant
- Has four input selector buttons
- Includes a MUTE button to disconnect the output and a PANEL LOCK button to prevent unwanted tampering with the buttons on the front panel
- Features a USB connector for setup and programming
- Features EDID PassThru. Passes EDID/HDCP signals from source to display
- Features enhanced EDID (Extended Display Identification Data) - The unit can store and recall an EDID setting in non-volatile memory from either the default EDID or a connected output, allowing convenient and reliable connection to the source
- Is compact in size. Two units can be rack mounted side-by-side in a 1U rack space with the optional Kramer **RK-1** rack kit

Control the **VS-41HDCP** using the front panel buttons, or remotely via:

- RS-232 serial commands (using Kramer 2000 and 3000 Protocols) transmitted by a touch screen system, PC, or other serial controller
- The Kramer infrared remote control transmitter
- The ETHERNET
- Remote control contact closure

3.1 Defining EDID

The Extended Display Identification Data (EDID) is a data-structure provided by a display, to describe its capabilities to a graphics card (that is connected to the display's source). The EDID enables the **VS-41HDCP** to "know" what kind of monitor is connected to the output. The EDID includes the manufacturer's name, the product type, the timing data supported by the display, the display size, luminance data and (for digital displays only) the pixel mapping data.
EDID is defined by a standard published by the Video Electronics Standards Association (VESA).

3.2 About HDCP

The High-Bandwidth Digital Content Protection (HDCP) standard developed by Intel protects digital video and audio signals transmitted over DVI or HDMI connections between two HDCP-enabled devices to eliminate the reproduction of copyrighted material. To protect copyright holders (such as movie studios) from having their programs copied and shared, the HDCP standard provides for the secure and encrypted transmission of digital signals.

4 Defining the VS-41HDCP 4x1 DVI Switcher

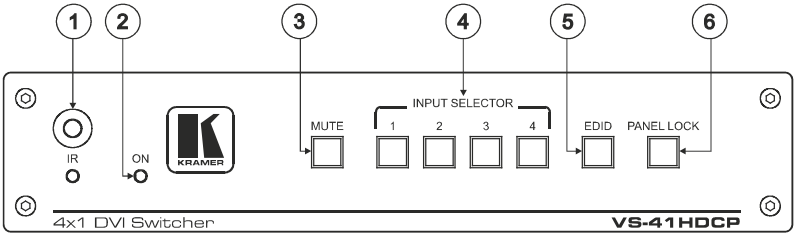

Figure 1: VS-41HDCP 4x1 DVI Switcher Front Panel

#	Feature	Function
1	IR Receiver	The yellow LED lights when receiving signals from the Infrared remote control transmitter
2	*ON* LED	Lights when receiving power
3	*MUTE* Button	Press to toggle disconnecting the output
4	*INPUT SELECTOR* Buttons	Press an INPUT button to select that input (from 1 to 4)
5	*EDID* Button	Press to acquire the EDID. This button illuminates when configuring the EDID
6	*PANEL LOCK* Button	Press to toggle disengaging the front panel buttons

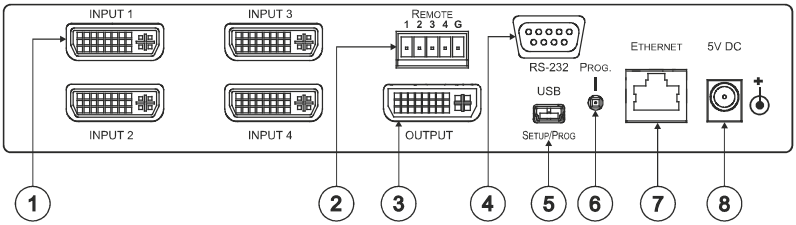

Figure 2: VS-41HDCP 4x1 DVI Switcher Rear Panel

#	Feature	Function
1	*INPUT* DVI Connectors	Connect to the DVI sources (from 1 to 4)
2	*REMOTE* Terminal Block Connectors	Connect to a contact closure switch (see Section 6.1)
3	*OUTPUT* DVI Connector	Connect to the DVI acceptor
4	*RS-232* 9-pin D-sub Port	Connects to the PC or the RS-232 Remote Controller
5	*SETUP/PROG USB* Connector	Connect to a computer for firmware upgrade
6	*PROG.* Button	Push in for "Program" to upgrade to the latest Kramer firmware (see Section 7), or release for Normal (the factory default)
7	*ETHERNET* Connector	Connects to the PC or other Ethernet Controller
8	*5V DC*	+5V DC connector for powering the unit

5 Connecting a VS-41HDCP 4x1 DVI Switcher

Always switch off the power to each device before connecting it to your **VS-41HDCP**. After connecting your **VS-41HDCP**, connect its power and then switch on the power to each device.

To connect the **VS-41HDCP** *4x1 DVI Switcher* (as illustrated in Figure 3), do the following:

1. Connect up to four computer graphics sources to the inputs (1 to 4). You do not have to connect all the DVI sources.
2. Connect the OUTPUT DVI connector to a DVI acceptor (for example, a display).
3. If required, connect a PC and/or controller to the RS-232 port and/or the ETHERNET port (see Section 6.4).
4. Connect the 5V DC power adapter to the power socket and connect the adapter to the mains electricity (not shown in Figure 3).
5. If required, acquire the EDID (see Section 6.1).

Press an INPUT SELECTOR button (from 1 to 4) to choose which DVI input to route to the output.

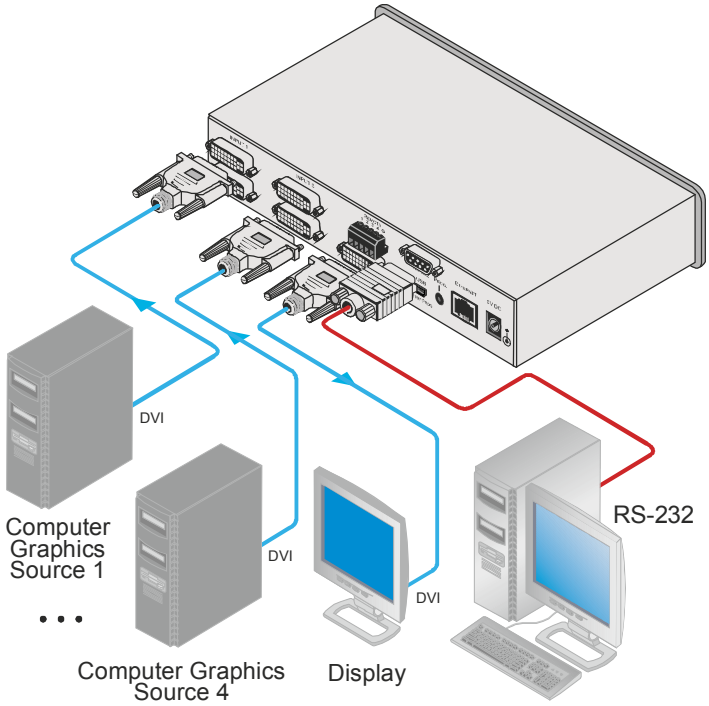

Figure 3: Connecting a VS-41HDCP 4x1 DVI Switcher

5.1 Connecting to the VS-41HDCP via RS-232

You can connect to the **VS-41HDCP** via an RS-232 connection using, for example, a PC. Note that a null-modem adapter/connection is not required.

To connect to the **VS-41HDCP** via RS-232:

- Connect the RS-232 9-pin D-sub rear panel port on the **VS-41HDCP** unit via a 9-wire straight cable (only pin 2 to pin 2, pin 3 to pin 3, and pin 5 to pin 5 need to be connected) to the RS-232 9-pin D-sub port on your PC

6 Operating the VS-41HDCP

This section describes how to:

- Operate the PC and DVD modes (see Section Section 6.1)
- Acquire the EDID (see Section 6.2)
- Control the machine via the REMOTE terminal block connector (see Section 6.3)
- Control the machine via the ETHERNET port (see Section 6.4)
- Control the machine via the Web pages (see Section 6.5)

6.1 The PC and DVD Modes

The **VS-41HDCP** has two operation modes that are specific per input: the PC mode (which is the factory default) and the DVD mode. The PC mode is used when connecting a computer or several computers to one or more of the inputs. The DVD mode is used when connecting a DVD or several DVDs to the inputs.

The PC mode and the DVD mode can be applied to a single input or to several inputs. For example, if you want to connect a computer to INPUT 1, another computer to INPUT 2, and DVD machines to INPUT 3 and INPUT 4, set INPUT 1 and INPUT 2 to the PC mode and INPUT 3 and INPUT 4 to the DVD mode.

To set the inputs to either the PC or DVD mode, do the following:

1. Turn off the POWER.
2. Press the PANEL LOCK button while turning the POWER on again.
3. Keep pressing and holding the PANEL LOCK button for a few seconds and then release it.
   The LOCK button blinks.
   If an input button illuminates, this indicates that that input is set to the DVD mode.
   If an input button is not illuminated, this indicates that that input is set to the PC mode.

4. Toggle between the PC mode (input button not illuminated) and the DVD mode (input button illuminated) by pressing that input.

5. Press the PANEL LOCK button to exit this mode.

The following table summarizes the differences between the PC mode and the DVD mode:

PC Mode	DVD Mode
The input is connected to a computer	The input is connected to a multimedia application, such as a DVD, a set top box and so on
The EDID is available at all times (to prevent computer reset)	The EDID is available only when that input is connected to an output
The input EDID source is the default EDID or an acquired EDID (see Section 6.1)	The input EDID source is acquired directly from the connected output

Note, that even if an input is set to the PC mode, you can connect a DVD player to that input and vice versa, a PC can be connected to an input that was set to the DVD mode.

6.2 Setting the EDID

You can acquire or change the EDID (see Section 6.2.1) or reset the machine to the default EDID (see Section 6.2.2).

If the connected output (for which EDID has already been acquired) is disconnected, the EDID button blinks and then ceases blinking when reconnecting the same output. When a new output is connected the EDID button blinks to indicate that new EDID information must be acquired.

6.2.1 Acquiring / Changing the EDID

You can work with the default EDID or acquire or change an EDID via the connected output. Use the EDID button to acquire the output EDID information.

To acquire or change the EDID of a new output display:

1. Connect the power supply.
2. Connect the new output display device.
   The EDID button blinks.
3. Press the EDID button.
   The INPUT buttons blink in sequence until the EDID is acquired.

6.2.2 Resetting the Default EDID

To reset the default EDID, disconnect the output and repeat the steps in Section 6.2.1.

6.3 Controlling via the REMOTE Terminal Block Connector

The contact closure remote control pins operate in a similar way to the INPUT SELECTOR button. Using the contact closure remote control you can select the DVI input. To do so, momentarily connect the required input pin (IN 1, IN2, IN 3 or IN 4) on the REMOTE terminal block connector to the GND (Ground) pin, as Figure 4 illustrates.

DO NOT connect more than one PIN to the GND PIN at the same time.

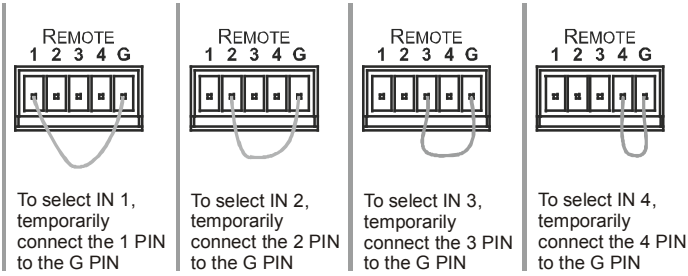
REMOTE
1 2 3 4 G
To select IN 1, temporarily connect the 1 PIN to the G PIN
REMOTE
1 2 3 4 G
To select IN 2, temporarily connect the 2 PIN to the G PIN
REMOTE
1 2 3 4 G
To select IN 3, temporarily connect the 3 PIN to the G PIN
REMOTE
1 2 3 4 G
To select IN 4, temporarily connect the 4 PIN to the G PIN

Figure 4: Connecting the Contact Closure Remote Control PINs

6.4 Controlling the VS-41HDCP via the ETHERNET Port

You can connect the **VS-41HDCP** via the Ethernet, using a crossover cable (see Section 6.4.1) for direct connection to the PC or a straight through cable (see Section 6.4.2) for connection via a network hub or network router.

6.4.1 Connecting the ETHERNET Port directly to a PC (Crossover Cable)

You can connect the Ethernet port of the **VS-41HDCP** to the Ethernet port on your PC, via a crossover cable with RJ-45 connectors.

This type of connection is recommended for identification of the factory default IP address of the **VS-41HDCP** during the initial configuration.

After connecting the Ethernet port, configure your PC as follows:

1. Right-click the My Network Places icon on your desktop.
2. Select **Properties**.
3. Right-click Local Area Connection Properties.
4. Select **Properties**.
   The Local Area Connection Properties window appears.
5. Select the Internet Protocol (TCP/IP) and click the **Properties** Button (see Figure 5).

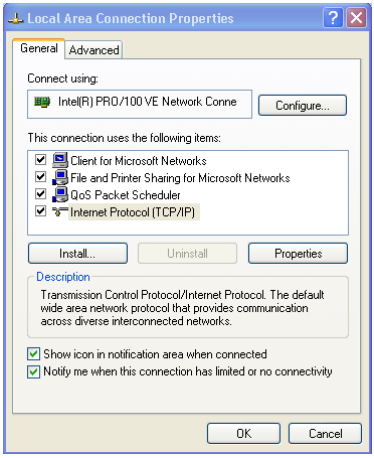

Figure 5: Local Area Connection Properties Window

6. Select Use the following IP Address, and fill in the details as shown in Figure 6.

7. Click **OK**.

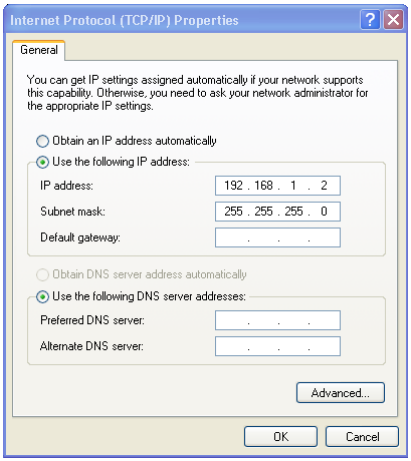
Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 1 . 2
Subnet mask:
255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Figure 6: Internet Protocol (TCP/IP) Properties Window

6.4.2 Connecting the ETHERNET Port via a Network Hub (Straight-Through Cable)

You can connect the Ethernet port of the **VS-41HDCP** to the Ethernet port on a network hub or network router, via a straight-through cable with RJ-45 connectors.

6.4.3 Configuring the Ethernet Port

To configure the Ethernet port, download the K-UPLOAD Ethernet configuration software. Extract the file to a folder and create a shortcut on your desktop to the file.

Follow these steps to configure the port:

1. Double click the K-UPLOAD desktop icon.
   The main screen appears:

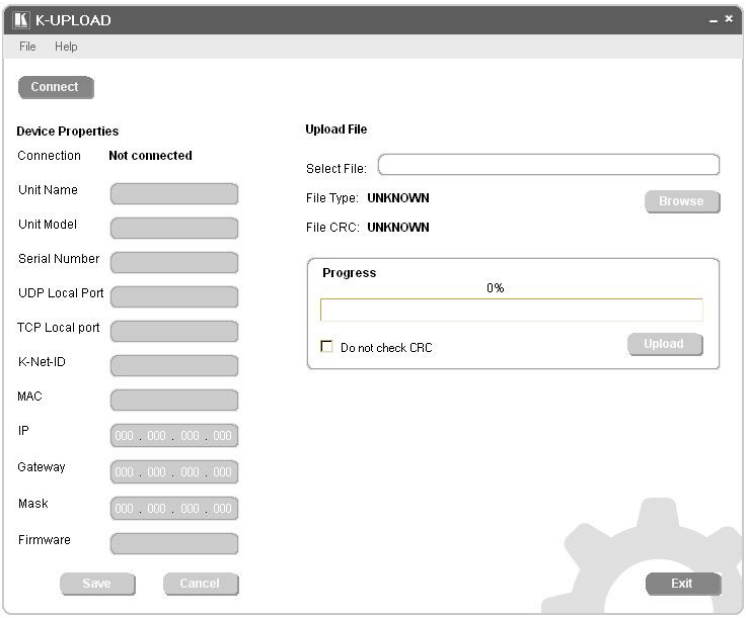

Figure 7: The Main Screen

2. Click the **Connect** button to connect to the machine to select the method to connect to the Ethernet port of the **VS-41HDCP**.
   Select:
   - Ethernet, if you know the IP address number or the machine name. The default name for the machine is KRAMER_XXXX (the four digits are the last four digits of the machine's serial number)
   - Serial, if you are connected via a serial port
   - USB, if you are connected via the USB

3. Select the connection method and click **Connect** .

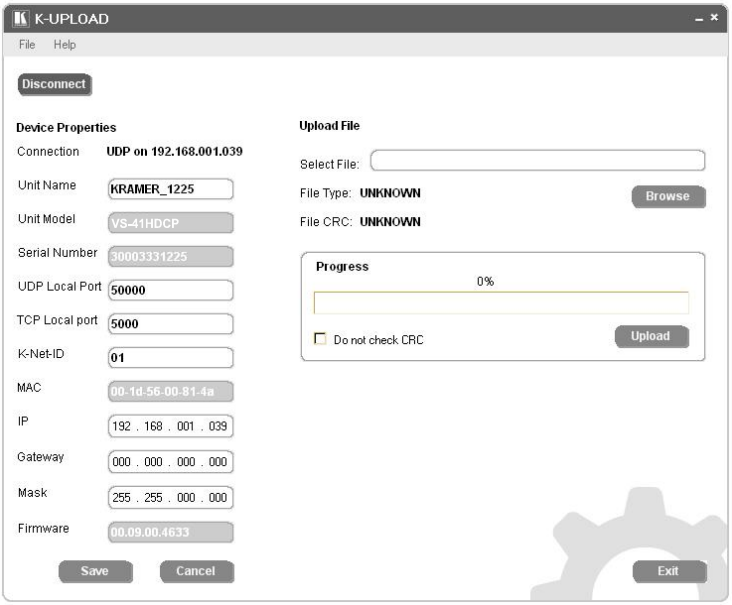

Figure 8: Device Properties Screen

4. If required, make changes and click Save. If not, click Exit.

6.5 Operating the VS-41HDCP using a Web Browser

The embedded Web pages can be used to remotely operate the **VS-41HDCP** using a Web browser and an Ethernet connection.

Before attempting to connect:

- Perform the procedures in Section 6.4.
- Ensure that the Java™ software is installed and functioning correctly on your computer. If not, download it from www.java.com
- Ensure that your browser is **supported**—Microsoft IE (V6.0 and higher), Google Chrome, Firefox (V3.0 and higher).
  To check that Java is installed and running correctly, browse to http://www.java.com/en/download/help/testvm.xml

This page runs a test and displays a Java success (see Figure 9) or failure message.

Figure 9: Java Test Page Success Message

If you do not see the success message, follow the instructions on the page to:

- Load and enable Java
- Enable Javascript in your browser

6.6 Log On to the VS-41HDCP Web Pages

To log on to **VS-41HDCP** Web pages:

1. Open your Internet browser.
2. Type the unit's IP number in the Address bar of your browser.

The **Loading** page appears.

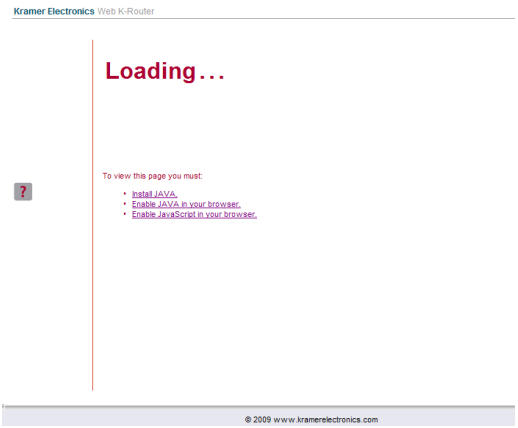

Figure 10: The Loading Page

The first time that you run the program, the Warning-Security screen appears:

Warning - Security
The application's digital signature cannot be verified.
Do you want to run the application?
Name: K_Applet
Publisher: Kramer Electronics
From: http://192.168.1.39
Always trust content from this publisher.
Run
Cancel
The digital signature cannot be verified by a trusted source. Only run if you trust the origin of the application.
More Information...

Figure 11: First Time Security Warning

3. Click **Run**.
   The main switching control Home page is displayed which shows a graphical interpretation of the front panel (see Figure 12).

The Web pages let you control the **VS-41HDCP** via the Ethernet. The menu appears on the left side of the screen. There are two remote operation Web pages:

- The PANEL main page (see Section 6.6.1)
- The configurations page (see Section 6.6.2)

A description of each Web page is displayed if you hover your mouse over the question mark that appears on the left side of the screen.

6.6.1 The PANEL Main Page

The **VS-41HDCP** main page inputs to the output by clicking the audio and/or video signal indicators (purple and blue, respectively).

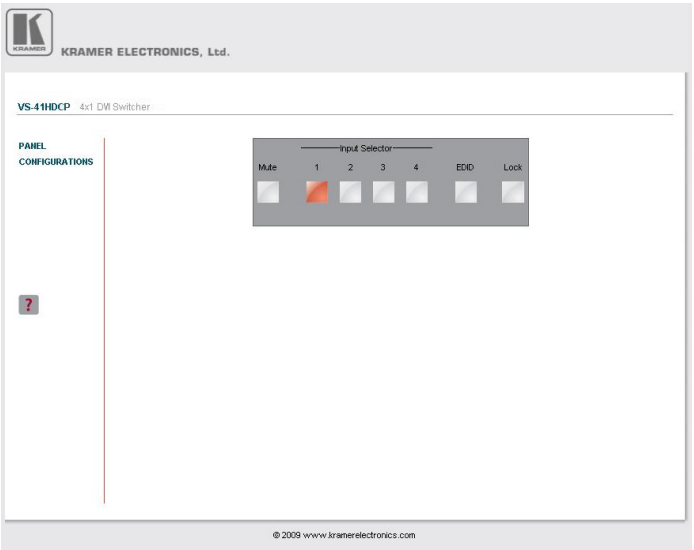

Figure 12: VS-41HDCP Switching Matrix Page

You can perform the following operations via this Web page:

- Select an input to switch to the output by clicking an input selector button
- Acquire the EDID (see Section 6.1)
- Click the Lock button to lock or unlock the front panel
- Click the Mute button to mute the audio signal

6.6.2 The CONFIGURATIONS Page

The Configurations page lets you view some Ethernet settings and change others (see Figure 13). Fields with a white background are editable; fields with a blue background are read-only.

To change the configuration definitions:

1. Click **CONFIGURATIONS**.
   The Configurations Web page appears.

2. Modify the values as required.

3. Click the blue **Submit** button to apply changes or Cancel to abandon them.
   A confirmation window appears asking if you are sure you want to change the network settings.

4. Click **Yes**.
   A window appears informing you that the configuration has been successfully changed.

5. Click **OK**.

6. If the IP address has been changed, close your browser and reload the Web page using the new IP address.

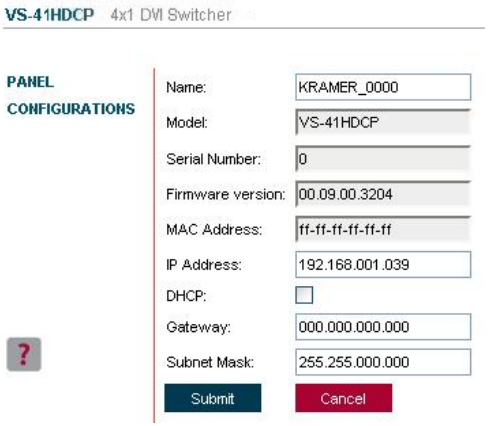

Figure 13: Configurations Page

7 Firmware Upgrade

For instructions on upgrading the firmware, see the K-UPLOAD guide.

The latest version of firmware and installation instructions can be downloaded from the Kramer Web site at www.kramerelectronics.com.

8 Technical Specifications

INPUTS:	4 DVI Connectors
OUTPUT:	1 DVI Connector
BANDWIDTH:	Supports up to 2.25Gbps bandwidth per graphic channel
COMPLIANCE WITH HDMI STANDARD:	Supports HDMI and HDCP
RESOLUTION:	Up to 1080p, UXGA
POWER SOURCE:	5V DC, 360mA
CONTROLS:	Front panel buttons, Infrared remote control transmitter, RS-232, contact closure remote control, Ethernet
DIMENSIONS:	22cm x 18cm x 4.5cm (8.6" x 7" x 1.8") W, D, H
WEIGHT:	1.3kg (2.9lbs) approx.
ACCESSORIES:	Power supply
OPTIONS:	Kramer DVI cables, RK-1 rack adapter
Specifications are subject to change without notice Go to our Web site at http://www.kramerelectronics.com to access the list of resolutions	

8.1 Default Communication Parameters

EDID			
Passes EDID/HDCP signals between the display and the source			
RS-232			
Protocol 2000		**Protocol 3000 (Default)**	
Baud Rate:	9600	Baud Rate:	115,200
Data Bits:	8	Data Bits:	8
Stop Bits:	1	Stop Bits:	1
Parity:	None	Parity:	None
Command Format:	HEX	Command Format:	ASCII
Example (Output 1 to Input 1):	0x01, 0x81, 0x81, 0x81	Example (Output 1 to Input 1):	#AV 1>1<CR>
Switching Protocol			
P2000 -> P3000		**P3000 -> P2000**	
Command:	0x38, 0x80, 0x83, 0x81	Command:	#P2000<CR>
Front Panel:	Press and hold input 1 and input 3 simultaneously	Front Panel:	Press and hold input 1 and input 2 simultaneously
Ethernet			
Default Settings		**Reset Settings**	
IP Address: 192.168.1.39		Power cycle the unit while holding in the Factory Reset button, located on the rear panel of the unit.	
TCP Port #: 5000			
UDP Port #: 50000			

9 Default EDID

The factory default EDID is listed below.

Monitor
  Model name..... VS-41HDCP
  Manufacturer..... KRM
  Plug and Play ID..... KRM7300
  Serial number..... 505-707455010
  Manufacture date..... 2009, ISO week 10

  EDID revision..... 1.3
  Input signal type..... Digital
  Color bit depth..... Undefined
  Display type..... RGB color
  Screen size..... 520 x 320 mm (24.0 in)
  Power management..... Standby, Suspend, Active off/sleep
  Extension blocs..... 1 (CEA-EXT)

  DDC/CI..... Not supported

Color characteristics
  Default color space..... Non-sRGB
  Display gamma..... 2.20
  Red chromaticity..... Rx 0.674 - Ry 0.319
  Green chromaticity..... Gx 0.188 - Gy 0.706
  Blue chromaticity..... Bx 0.148 - By 0.064
  White point (default).... Wx 0.313 - Wy 0.329
  Additional descriptors... None

Timing characteristics
  Horizontal scan range.... 30-83kHz
  Vertical scan range..... 56-76Hz
  Video bandwidth..... 170MHz
  CVT standard..... Not supported
  GTF standard..... Not supported
  Additional descriptors... None
  Preferred timing..... Yes
  Native/preferred timing.. 1280x720p at 60Hz (16:10)
    Modeline..... "1280x720" 74.250 1280 1390 1430 1650 720 725 730 750 +hsync +vsync

Standard timings supported
    720 x 400p at 70Hz - IBM VGA
    640 x 480p at 60Hz - IBM VGA
    640 x 480p at 75Hz - VESA
    800 x 600p at 60Hz - VESA
    800 x 600p at 75Hz - VESA
   1024 x 768p at 60Hz - VESA
   1024 x 768p at 75Hz - VESA
   1280 x 1024p at 75Hz - VESA
   1280 x 1024p at 60Hz - VESA STD
   1600 x 1200p at 60Hz - VESA STD
   1152 x 864p at 75Hz - VESA STD

10 Kramer Protocol

You can download our user-friendly *Software for Calculating Hex Codes for Protocol 2000*" from the technical support section on our Web site at http://www.kramerelectronics.com.

Section 10.1 describes how to switch between Protocol 3000 and Protocol 2000. Section 10.2 defines Protocol 3000 and Section 10.3 defines Protocol 2000.

By default, the **VS-41HDCP** is set to Kramer's Protocol 3000, but it is also compatible with Protocol 2000.

10.1 Switching Protocols

You can switch protocols either via the front panel buttons (see Section 10.1.1) or by sending protocol commands (see Section 10.1.2).

10.1.1 Switching Protocols via the Front Panel Buttons

To switch from Protocol 3000 to Protocol 2000, press and hold the INPUT 1 and INPUT 2 buttons for a few seconds (not as part of the switching operation).

To switch from Protocol 2000 to Protocol 3000, press and hold the INPUT 1 and INPUT 3 buttons for a few seconds.

The Windows®-based Kramer control software operates with Protocol 2000. If the **VS-41HDCP** is set to Protocol 3000, use the front panel buttons to switch to Protocol 2000

10.1.2 Switching Protocols via Protocol Commands

To switch from Protocol 3000 to Protocol 2000, send the following command:
#P2000<CR>

To switch from Protocol 2000 to Protocol 3000, send the following command:
0x38, 0x80, 0x83, 0x81

10.2 Kramer Protocol 3000

This RS-232/RS-485 communication protocol lets you control the machine from any standard terminal software (for example, Windows® HyperTerminal) with default settings of 115200 baud data rate, no parity, 8 data bits, and 1 stop bit.

10.2.1 Protocol 3000 Syntax

Host message format:

Start	Address (optional)	Body	Delimiter
#	*Destination_id*@	message	CR

Simple command (commands string with only one command without addressing):

start	body	delimiter
#	Command SP Parameter_1,Parameter_2,…	CR

Commands string (formal syntax with commands concatenation and addressing):

Address**@ Command_1** Parameter1_1,Parameter1_2,… **|**Command_2 Parameter2_1,Parameter2_2,… **|**Command_3 Parameter3_1,Parameter3_2,… |…**CR**

Device message format:

Start	Address (optional)	Body	Delimiter
~	Sender_id@	message	CR LF

Device long response (**Echoing command**):

Start	Address (optional)	Body	Delimiter
~	Sender_id@	**command** SP **[***param1 ,param2 …***]** result	CR LF

CR = Carriage return (ASCII 13 = 0x0D)

LF = Line feed (ASCII 10 = 0x0A)

SP = Space (ASCII 32 = 0x20)

10.2.2 Command Parts Details

Command:
Sequence of ASCII letters ('A'-'Z', 'a'-'z' and '-').
Command will separate from parameters with at least single space.

Parameters:
Sequence of Alfa-Numeric ASCII chars ('0'-'9','A'-'Z','a'-'z' and some special chars for specific commands), parameters will be separated by commas.

Message string:
Every command must to be entered as part of message string that begin with **message starting char** and end with **message closing char**, note that string can contain more then one command separated by pipe ("|") char.

Message starting char:
'#' for host command\query.
'~' for machine response.
Device address (Optional, for Knet):
Knet Device ID follow by '@' char.
Query sign = '?', will follow after some commands to define query request.
Message closing char =
Host messages - Carriage Return (ASCII 13), will be referred to by **CR** in this document.
Machine messages **-** Carriage Return (ASCII 13) + Line-Feed (ASCII 10), will be referred to by **CRLF**.
Spaces between parameters or command parts will be ignored.

Commands chain separator char:
When **message string** contains more than one command, commands will be separated by pipe ("|").

Commands entering:
If terminal software used to connect over serial \ ethernet \ USB port, that possible to directly enter all commands characters (CR will be entered by Enter key, that key send also LF, but this char will be ignored by commands parser).
Sending commands from some controllers (like Crestron) require coding some characters in special form (like \X##).
Anyway, there is a way to enter all ASCII characters, so it is possible to send all commands also from controller.
(Similar way can use for URL \ Telnet support that maybe will be added in future).

Commands forms:
Some commands have short name syntax beside the full name to allow faster typing, response is always in long syntax.

Commands chaining:
It is possible to enter multiple commands in same string by '|' char (pipe).
In this case the **message starting char** and the **message closing char** will be entered just one time, in the string beginning and at the end.
All the commands in string will not execute until the closing char will be entered.
Separate response will be sent for every command in the chain.

Input string max length:
64 characters.

Backward support:
Design note: Transparent support for Protocol 2000 will be implemented by switch Protocol command from Protocol 3000 to Protocol 2000, in Protocol 2000 there is already such a command to switch Protocol to ASCII Protocol (#56 : H38 H80 H83 H81).

Instruction Codes for Protocol 3000			
Command Name	**Short Cmd**	**Command Type**	**Permission**
#		Common-mandatory	End User
Protocol handshaking			
Syntax			
#CR			
Response			
~nn@SP**OK**CR LF			
Parameters			
Notes			
Use to validate protocol 3000 connection and to get machine number.			

Command Name	Short Cmd	Command Type	Permission
BUILD-DATE		Common-mandatory	End User
Read device build date			
Syntax			
#BUILD-DATE?CR			
Response			
~nn@**BUILD-DATE**SP*date*SP*time*CR LF			
Parameters			
date – Format: YYYY/MM/DD where YYYY = Year. MM = Month. DD = Day. ***time*** – Format: hh:mm:ss where hh = hours. mm = minutes. ss = seconds.			

Command Name	Short Cmd	Command Type	Permission
MODEL?		Common-mandatory	End User
Read device model			
Syntax			
#MODEL?CR			
Response			
~nn@**MODEL**SP*model_name*CR LF			
Parameters			
model_name – String of printable ASCII chars (up to 19 chars).			

Command Name	Short Cmd	Command Type	Permission
SN?		Common-mandatory	End User
Reset device serial number			
Syntax			
#SN?CR			
Response			
~nn@**SN**SP*serial_number*CR LF			
Parameters			
serial_number – 11 decimal digits. Assign by Kramer factory.			
Notes			
For new products with 14 digits serial we kept only the last 11.			

Command Name	Short Cmd	Command Type	Permission
VERSION?		Common-mandatory	End User
Reset device serial number			
Syntax			
#VERSION?CR			
Response			
~nn@**VERSION**SPfirmware_versionCR LF			
Parameters			
firmware_version – Format: XX.XX.XX.XXXX where the digit groups are: Major.Minor.Build.Revision			

Command Name	Short Cmd	Command Type	Permission
LOCK-FP		Common	End User
Lock front panel			
Syntax			
Option 1: **#LOCK-FP** SP *lock_mode* CR			
Option 2: **#LOCK-FP** SP *device_id, lock_mode* CR			
Response			
Option 1: ~nn**@LOCK-FP** SP *lock_mode* SP **OK** CR LF			
Option 2: **~01@LOCK-FP** SP *device_id,lock_mode* SP **OK** CR LF			
Parameters			
lock_mode – '0' or 'off' to unlock front panel buttons. '1' or 'on' to lock front panel buttons. ***device_id*** – For K-Net controllers, select the buttons panel to lock. Locking is allowed only from the master.			

Command Name	Short Cmd	Command Type	Permission
LOCK-FP?		Common	End User
Get lock state of front panel			
Syntax			
Option 1: **#LOCK-FP?** CR			
Option 2: **#LOCK-FP?** SP *device_id* CR			
Response			
Option 1: ~nn**@LOCK-FP** SP *lock_mode* CR LF			
Option 2: **~01@LOCK-FP** SP *device_id, lock_mode* CR LF			
Parameters			
lock_mode – 'OFF' for unlocked front panel. 'ON' for locked front panel. ***device_id*** – For K-Net controllers, select the buttons panel to get lock state. State is available only from the master.			

Command Name	Short Cmd	Command Type	Permission
NAME?		Common (Ethernet)	End User
Get machine (DNS) name			
Syntax			
#NAME? CR			
Response			
~nn**@NAME** SP machine_name CR LF			
Parameters			
machine_name – String of up to 14 alpha-numeric chars (can include hyphen, not in beginning or end).			
Notes			
The machine name is not the same as the model name. The machine name is used to identify a specific machine or a network in use (with DNS feature on).			

Command Name	Short Cmd	Command Type	Permission
AV		Switch	End User
Switch Audio and Video			
Syntax			
#AV SP in>out, in>out,… CR			
Response			
~nn@**AV** SP in>out, in>out,… CR LF			
Parameters			
In - input number or '0' to disconnect output **'>'** = Connection character between in and out parameters ***out*** = Output number or '*' for all outputs			

Command Name	Short Cmd	Command Type	Permission
VID	V	Switch	End User
Switch Video			
Syntax			
#VID SP in>out, in>out,… CR			
Response			
~nn@**VID** SP *in>out* CR LF ~nn@**VID** SP *in>out* CR LF …			
Parameters			
In - input number or '0' to disconnect output **'>'** = Connection character between in and out parameters ***out*** = Output number or '*' for all outputs			
Notes			
When AFV switching mode is active, this command also switches Audio and the unit replies with command ~AV.			

Command Name	Short Cmd	Command Type	Permission
VID?	V?	Switch	End User
Get Video Switch Stat			
Syntax			
#VID? SP *out* CR **#VID?** SP * CR			
Response			
~nn@**VID** SP *in>out* CR LF ~nn@**VID** SP in>1 , in>2 , … CR LF			
Parameters			
in - input number or '0' to disconnect output **'>'** = Connection character between in and out parameters ***out*** = Output number or '*' for all outputs			

Command Name	Short Cmd	Command Type	Permission
ETH-PORT	ETHP	Ethernet	Administrator
Change protocol Ethernet port			
Syntax			
#ETH-PORT SP protocol, port CR			
Response			
~nn@**ETH-PORT** SP *protocol, port* SP **OK** CR LF			
Parameters			
protocol = TCP or UDP (transport layer protocol) ***port*** = Ethernet port that accepts Protocol 3000 commands: 1-65535 = User defined port 0 - Reset port to factory default (50000 for UDP, 5000 for TCP)			
Notes			
Device may get new setting only after restart or closing current port. Some device port 50000 is the default also for TCP Resetting port by value 0 may not work in all devices For proper settings consult your network administrator			

Command Name	Short Cmd	Command Type	Permission
ETH-PORT?	ETHP?	Ethernet	End User
Get protocol Ethernet port			
Syntax			
#ETH-PORT? SP protocol CR			
Response			
~nn@**ETH-PORT** SP *protocol, port* CR LF			
Parameters			
protocol = TCP or UDP (transport layer protocol) ***port*** = Ethernet port that accepts Protocol 3000 commands.			
Notes			
Default Port is 50000 for UDP, 5000 for TCP Some device has port 50000 as default also for TCP			

Command Name	Short Cmd	Command Type	Permission
NET-DHCP	NTDH	Ethernet	Administrator
Set DHCP mode			
Syntax			
#NET-DHCP SP *mode* CR			
Response			
~nn@ **NET-DHCP** SP mode SP **OK** CR LF			
Parameters			
mode - '0' – Don't use DHCP (Use IP set by factory or IP set command). '1' – Try to use DHCP. If unavailable, use IP as above.			
Notes			
Connection of Ethernet to devices with DHCP may take more time in some networks. To allow connecting if randomly assigned IP by DHCP - Give the device DNS name (if available) by the command "NAME". It possible to get assigned IP also by direct connection to USB or RS-232 protocol port if available. For proper settings consult your network administrator			

Command Name	Short Cmd	Command Type	Permission
NET-DHCP?	NTDH?	Ethernet	End User
Get DHCP mode			
Syntax			
#NET-DHCP?CR			
Response			
~nn@ **NET-DHCP** SP *mode* CR LF			
Parameters			
mode - '0' – Don't use DHCP (Use IP set by factory or IP set command). '1' – Try to use DHCP. If unavailable, use IP as above.			
Notes			
Connection of Ethernet to devices with DHCP may take more time in some networks. To allow connecting if randomly assigned IP by DHCP - Give the device DNS name (if available) by the command "NAME". It possible to get assigned IP also by direct connection to USB or RS-232 protocol port if available.			

Command Name	Short Cmd	Command Type	Permission
NET-GATE	NTGT	Ethernet	Administrator
Set Gateway IP			
Syntax			
#NET-GATE SP *ip_address* CR			
Response			
~nn@ **NET-GATE** SP *ip_address* SP **OK** CR LF			
Parameters			
ip_address – format: xxx.xxx.xxx.xxx			
Notes			
Network gateway allows connecting to the device via another network and maybe over Internet. Be careful of security problems. For proper settings consult your network administrator			

Command Name	Short Cmd	Command Type	Permission
NET-GATE?	NTGT?	Ethernet	End User
Get Gateway IP			
Syntax			
#NET-GATE?CR			
Response			
~nn@ **NET-GATE** SP *ip_address* CR LF			
Parameters			
ip_address – format: xxx.xxx.xxx.xxx			
Notes			
Network gateway allowed connecting to device via another network and maybe over Internet. Be careful of security problems.			

Command Name	Short Cmd	Command Type	Permission
NET-IP	NTIP	Ethernet	Administrator
Set device IP address			
Syntax			
#NET-IP SP ip_address CR			
Response			
~nn@ **NET-IP** SP *ip_address* SP **OK** CR LF			
Parameters			
ip_address – format: xxx.xxx.xxx.xxx			
Notes			
For proper settings consult your network administrator			

Command Name	Short Cmd	Command Type	Permission
NET-IP?	NTIP?	Ethernet	End User
Get device IP address			
Syntax			
#NET-IP? CR			
Response			
~nn@ **NET-IP** SP *ip_address* CR LF			
Parameters			
ip_address – format: xxx.xxx.xxx.xxx where x is decimal digit.			

Command Name	Short Cmd	Command Type	Permission
NET-MAC?	NTMC?	Ethernet	End User
Get MAC address			
Syntax			
#NET-MAC? CR			
Response			
~nn@**NET-MAC** SP *mac_address* CR LF			
Parameters			
mac_address – Unique MAC address. Format: XX-XX-XX-XX-XX-XX where X is hex digit.			

Command Name	Short Cmd	Command Type	Permission
NET-MASK	NTMSK	Ethernet	Administrator
Set device subnet mask			
Syntax			
#NET-MASK SP *net_mask* CR			
Response			
~nn@**NET-MASK** SP *net_mask* SP **OK** CR LF			
Parameters			
net_mask – format: xxx.xxx.xxx.xxx			
Notes			
Subnet mask limit Ethernet connection within local network. For proper settings consult your network administrator			

Command Name	Short Cmd	Command Type	Permission
NET-MASK?	NTMSK?	Ethernet	End User
Get device subnet mask			
Syntax			
#NET-MASK? CR			
Response			
~nn@**NET-MASK** SP net_mask CR LF			
Parameters			
net_mask – format: xxx.xxx.xxx.xxx			
Notes			
Subnet mask limit Ethernet connection within local network. For proper settings consult your network administrator			

Command Name	Short Cmd	Command Type	Permission
P2000		Common	End User
Switch to protocol 2000			
Syntax			
#P2000? CR			
Response			
~nn@**P2000** SP OK CR LF			
Parameters			
Notes			
Available only for devices that support Protocol 2000 Protocol 2000 has a command to switch back to ASCII protocol (like Protocol 3000)			

10.3 Kramer Protocol 2000

This RS-232/RS-485 communication protocol uses four bytes of information as defined below. The default data rate is 9600 baud, with no parity, 8 data bits and 1 stop bit.

MSB LSB

	DESTINATION INSTRUCTION						
0	D	N5	N4	N3	N2	N1	N0
7	6	5	4	3	2	1	0

1st byte

	INPUT						
1	I6	I5	I4	I3	I2	I1	I0
7	6	5	4	3	2	1	0

2nd byte

	OUTPUT						
1	O6	O5	O4	O3	O2	O1	O0
7	6	5	4	3	2	1	0

3rd byte

			MACHINE NUMBER				
1	OVR	X	M4	M3	M2	M1	M0
7	6	5	4	3	2	1	0

4th byte

1st BYTE: Bit 7 – Defined as 0.
D – "DESTINATION": 0 - for sending information to the switchers (from the PC);
1 - for sending to the PC (from the switcher).
N5…N0 – "INSTRUCTION"
The function that is to be performed by the switcher(s) is defined by the INSTRUCTION (6 bits). Similarly, if a function is performed via the machine's keyboard, then these bits are set with the INSTRUCTION NO., which was performed. The instruction codes are defined according to the table below (INSTRUCTION NO. is the value to be set for N5…N0).

2nd BYTE: Bit 7 – Defined as 1.
I6…I0 – "INPUT".
When switching (ie. instruction codes 1 and 2), the INPUT (7 bits) is set as the input number which is to be switched. Similarly, if switching is done via the machine's front-panel, then these bits are set with the INPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

3rd BYTE: Bit 7 – Defined as 1.
O6…O0 – "OUTPUT".
When switching (ie. instruction codes 1 and 2), the OUTPUT (7 bits) is set as the output number which is to be switched. Similarly, if switching is done via the machine's front-panel, then these bits are set with the OUTPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

4th BYTE: Bit 7 – Defined as 1.
Bit 5 – Don't care.
OVR – Machine number override.
M4…M0 – MACHINE NUMBER.
Used to address machines in a system via their machine numbers. When several machines are controlled from a single serial port, they are usually configured together with each machine having an individual machine number. If the OVR bit is set, then all machine numbers will accept (implement) the command, and the addressed machine will reply.
For a single machine controlled via the serial port, always set M4…M0 = 1, and make sure that the machine itself is configured as MACHINE NUMBER = 1.

All the values in the table are decimal, unless otherwise stated

Instruction Codes for Protocol 2000				
Instruction		Definition for Specific Instruction		Notes
#	Description	Input	Output	
0	RESET VIDEO	0	0	1
1	SWITCH INPUT	Set equal to video input which is to be switched (0 = disconnect)	Set equal to video output which is to be switched (0 = to all the outputs)	2
5	REQUEST STATUS OF A VIDEO OUTPUT	Set as SETUP #	Equal to output number whose status is required	4, 3
16	ERROR / BUSY	For invalid / valid input (i.e. OUTPUT byte = 4 or OUTPUT byte = 5), this byte is set as the input #	0 - error 1 - invalid instruction 2 - out of range 3 - machine busy 4 - invalid input 5 - valid input 6 - RX buffer overflow	
30	LOCK FRONT PANEL	0 - Panel unlocked 1 - Panel locked	0	2
31	REQUEST WHETHER PANEL IS LOCKED	0	0	16
56	CHANGE TO ASCII	0	Kramer protocol 3000	19
61	IDENTIFY MACHINE	1 - video machine name 2 - audio machine name 3 - video software version 4 - audio software version	0 - Request first 4 digits 1 - Request first suffix 2 - Request second suffix 3 - Request third suffix 10 - Request first prefix 11 - Request second prefix 12 - Request third prefix	13
62	DEFINE MACHINE	1 - number of inputs 2 - number of outputs 3 - number of setups	1 - for video 2 - for audio	14

NOTES on the above table:
NOTE 1 - When the master switcher is reset, (e.g. when it is turned on), the reset code is sent to the PC. If this code is sent to the switchers, it will reset according to the present power-down settings.

NOTE 2 - These are bidirectional definitions. That is, if the switcher receives the code, it will perform the instruction; and if the instruction is performed (due to a keystroke operation on the front panel), then these codes are sent. For example, if the HEX code
01 85 88 83
was sent from the PC, then the switcher (machine 3) will switch input 5 to output 8. If the user switched input 1 to output 7 via the front panel keypad, then the switcher will send HEX codes:
41 81 87 83
to the PC.
When the PC sends one of the commands in this group to the switcher, then, if the instruction is valid, the switcher replies by sending to the PC the same four bytes that it was sent (except for the first byte, where the DESTINATION bit is set high).

NOTE 3 - SETUP # 0 is the present setting. SETUP # 1 and higher are the settings saved in the switcher's memory, (i.e. those used for Store and Recall).

NOTE 4 - The reply to a "REQUEST" instruction is as follows: the same instruction and INPUT codes as were sent are returned, and the OUTPUT is assigned the value of the requested parameter. The replies to instructions 10 and 11 are as per the definitions in instructions 7 and 8 respectively. For example, if the present status of machine number 5 is breakaway setting, then the reply to the HEX code

0B 80 80 85
would be HEX codes
4B 80 81 85

NOTE 9 - An error code is returned to the PC if an invalid instruction code was sent to the switcher, or if a parameter associated with the instruction is out of range (e.g. trying to save to a setup greater than the highest one, or trying to switch an input or output greater than the highest one defined). This code is also returned to the PC if an RS-232 instruction is sent while the machine is being programmed via the front panel. Reception of this code by the switcher is not valid.
NOTE 10 – This code is reserved for internal use.

NOTE 13 - This is a request to identify the switcher/s in the system. If the OUTPUT is set as 0, and the INPUT is set as 1, 2, 5 or 7, the machine will send its name. The reply is the decimal value of the INPUT and OUTPUT. For example, for a 2216, the reply to the request to send the audio machine name would be (HEX codes):
7D 96 90 81 (i.e. 128dec+ 22dec for 2nd byte, and 128dec+ 16dec for 3rd byte).

If the request for identification is sent with the INPUT set as 3 or 4, the appropriate machine will send its software version number. Again, the reply would be the decimal value of the INPUT and OUTPUT - the INPUT representing the number in front of the decimal point, and the OUTPUT representing the number after it. For example, for version 3.5, the reply to the request to send the version number would be (HEX codes):
7D 83 85 81 (i.e. 128dec+ 3dec for 2nd byte, 128dec+ 5dec for 3rd byte).

If the OUTPUT is set as 1, then the ASCII coding of the lettering following the machine's name is sent. For example, for the VS-7588YC, the reply to the request to send the first suffix would be (HEX codes):
7D D9 C3 81 (i.e. 128dec+ ASCII for "Y"; 128dec+ ASCII for "C").

NOTE 14 - The number of inputs and outputs refers to the specific machine which is being addressed, not to the system. For example, if six 16X16 matrices are configured to make a 48X32 system (48 inputs, 32 outputs), the reply to the HEX code
3E 82 81 82 (ie. request the number of outputs)
would be HEX codes
7E 82 90 82
ie. 16 outputs

NOTE 16 - The reply to the "REQUEST WHETHER PANEL IS LOCKED" is as in NOTE 4 above, except that here the OUTPUT is assigned with the value 0 if the panel is unlocked, or 1 if it is locked.

NOTE 19 – After this instruction is sent, the unit will respond to the ASCII command set defined by the OUTPUT byte. The ASCII command to operate with the HEX command set must be sent in order to return to working with HEX codes.

NOTE 25 – For units which detect the validity of the video inputs, Instruction 16 will be sent whenever the unit detects a change in the state of an input (in real-time).
For example, if input 3 is detected as invalid, the unit will send the HEX codes
10 83 84 81
If input 7 is detected as valid, then the unit will send HEX codes
10 87 85 81.

LIMITED WARRANTY

We warrant this product free from defects in material and workmanship under the following terms.

HOW LONG IS THE WARRANTY

Labor and parts are warranted for seven years from the date of the first customer purchase.

WHO IS PROTECTED?

Only the first purchase customer may enforce this warranty.

WHAT IS COVERED AND WHAT IS NOT COVERED

Except as below, this warranty covers all defects in material or workmanship in this product. The following are not covered by the warranty:

1. Any product which is not distributed by us or which is not purchased from an authorized Kramer dealer. If you are uncertain as to whether a dealer is authorized, please contact Kramer at one of the agents listed in the Web site www.kramerelectronics.com.
2. Any product, on which the serial number has been defaced, modified or removed, or on which the WARRANTY VOID IF TAMPERED sticker has been torn, reattached, removed or otherwise interfered with.
3. Damage, deterioration or malfunction resulting from:
   i) Accident, misuse, abuse, neglect, fire, water, lightning or other acts of nature
   ii) Product modification, or failure to follow instructions supplied with the product
   iii) Repair or attempted repair by anyone not authorized by Kramer
   iv) Any shipment of the product (claims must be presented to the carrier)
   v) Removal or installation of the product
   vi) Any other cause, which does not relate to a product defect
   vii) Cartons, equipment enclosures, cables or accessories used in conjunction with the product

WHAT WE WILL PAY FOR AND WHAT WE WILL NOT PAY FOR

We will pay labor and material expenses for covered items. We will not pay for the following:

1. Removal or installations charges.
2. Costs of initial technical adjustments (set-up), including adjustment of user controls or programming. These costs are the responsibility of the Kramer dealer from whom the product was purchased.
3. Shipping charges.

HOW YOU CAN GET WARRANTY SERVICE

1. To obtain service on you product, you must take or ship it prepaid to any authorized Kramer service center.
2. Whenever warranty service is required, the original dated invoice (or a copy) must be presented as proof of warranty coverage, and should be included in any shipment of the product. Please also include in any mailing a contact name, company, address, and a description of the problem(s).
3. For the name of the nearest Kramer authorized service center, consult your authorized dealer.

LIMITATION OF IMPLIED WARRANTIES

All implied warranties, including warranties of merchantability and fitness for a particular purpose, are limited in duration to the length of this warranty.

EXCLUSION OF DAMAGES

The liability of Kramer for any effective products is limited to the repair or replacement of the product at our option. Kramer shall not be liable for:

1. Damage to other property caused by defects in this product, damages based upon inconvenience, loss of use of the product, loss of time, commercial loss; or:
2. Any other damages, whether incidental, consequential or otherwise. Some countries may not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights, which vary from place to place.

NOTE: All products returned to Kramer for service must have prior approval. This may be obtained from your dealer.

This equipment has been tested to determine compliance with the requirements of:

EN-50081: "Electromagnetic compatibility (EMC); generic emission standard. Part 1: Residential, commercial and light industry"
EN-50082: "Electromagnetic compatibility (EMC) generic immunity standard. Part 1: Residential, commercial and light industry environment".
CFR-47: FCC* Rules and Regulations: Part 15: "Radio frequency devices Subpart B Unintentional radiators"

CAUTION!

- Servicing the machines can only be done by an authorized Kramer technician. Any user who makes changes or modifications to the unit without the expressed approval of the manufacturer will void user authority to operate the equipment.
- Use the supplied DC power supply to feed power to the machine.
- Please use recommended interconnection cables to connect the machine to other components.

* FCC and CE approved using STP cable (for twisted pair products)

For the latest information on our products and a list of Kramer distributors, visit our Web site where updates to this user manual may be found.

We welcome your questions, comments, and feedback.
Web site: www.kramerelectronics.com
E-mail: info@kramerel.com

SAFETY WARNING
Disconnect the unit from the power supply before opening and servicing